What is Claimed is:

1. A method for manufacturing a nano-tube comprising the steps of:

arranging a first electrode and a second electrode in a manner to be opposite to each other in an air atmosphere, said second electrode being made of a material mainly consisting of a carbon material;

applying a voltage between said first electrode and said second electrode to carry out arc discharge therebetween; and

forming a carbon material on a predetermined region of said second electrode into a nano-tube due to said arc discharge.

2. A method as defined in claim 1, wherein said first electrode is constituted by a torch electrode provided at an arc torch; and

said step of forming said carbon material on said predetermined region of said second electrode into said nano-tube due to said arc discharge is carried out while moving said torch electrode and second electrode relatively to each other.

3. A method as defined in claim 1 or 2, wherein said second electrode is arranged on a surface of a substrate; and

said step of forming said carbon material on said predetermined region of said second electrode into said nano-tube due to said arc discharge is carried out while holding said substrate on a cooling member to cool said substrate through said cooling member.

4. A method as defined in claim 1 or 2, wherein said step of forming said carbon material on said predetermined region of said second electrode into said nano-tube due to said arc discharge is carried out while surrounding at least said first electrode, said second electrode and an arc discharge region between said first electrode and said second electrode with a surrounding member.

5. A method as defined in claim 1 or 2, wherein said carbon material for said second electrode is any one selected from the group consisting of graphite, carbon, activated carbon, amorphous carbon and graphite.

6. A method as defined in claim 1 or 2, wherein said carbon material for said second electrode is any one selected from the group consisting of a carbon material containing a metal catalyst, that having a metal catalyst formed on a surface thereof, that containing B and a metal catalyst, that having B formed on a surface thereof and that having B and a metal catalyst formed on a surface thereof.

7. A method as defined in claim 6, wherein said metal catalyst is selected from the group consisting of Li, B, Mg, Al, Si, P, S, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Y, Zr, Nb, Mo, Rh, Pd, In, Sn, Sb, La, Hf, Ta, W, Os, Pt, an oxide thereof, a nitride thereof, a carbide thereof, a sulfide thereof, a chloride thereof, a sulfate thereof, a nitrate thereof and a mixture thereof.

8. A method as defined in any one of claims 1, 2 and 4, wherein said arc discharge is carried out while feeding specific gas to a region in which said arc discharge is generated.

9. A method as defined in claim 8, wherein said specific gas is selected from the group consisting of rare gas such as Ar, He or the like, air, nitrogen

gas, carbon dioxide gas, oxygen gas, hydrogen gas and a mixture thereof.

10. A method as defined in claim 1 or 2, wherein said first electrode is made of a material mainly consisting of graphite, activated carbon and amorphous carbon.

11. A method as defined in claim 1 or 2, wherein said arc discharge is generated by a DC or a DC pulse; and

said second electrode acts as an anode for said arc discharge.

12. A method as defined in claim 1 or 2, wherein said arc discharge is generated by an AC or an AC pulse.

13. A nano-tube manufactured according to the method defined in any one of claims 1 to 12.

14. An apparatus for manufacturing a nano-tube comprising:

a first electrode and a second electrode arranged in a manner to be opposite to each other in an air atmosphere, said second electrode being made of a material mainly consisting of a carbon material, that containing a metal catalyst and that having a metal catalyst formed on a surface thereof;

an arc generation means including a power supply for applying a voltage between said first electrode and said second electrode to generate arc discharge with respect to a predetermined region of said second electrode, resulting in a carbon material in said predetermined region being formed into a nano-tube due to said arc discharge; and

a specific gas feed means for feeding specific gas to a region in which said arc discharge is generated.

15. An apparatus as defined in claim 14, wherein said first electrode is constituted by a torch electrode provided at an arc torch;

further comprising:

a transfer means for moving said torch electrode and second electrode relatively to each other;

whereby a voltage is applied between said torch electrode and said second electrode while moving said torch electrode and second electrode relatively to each other, to thereby generate arc discharge with respect to a predetermined region of said second electrode, resulting in a carbon material on said predetermined region being formed into a nano-tube due to said arc discharge.

16. An apparatus as defined in claim 14 or 15, wherein said second electrode is arranged on a substrate;

further comprising:

a holding means for holding said first electrode and second electrode while keeping said first electrode and second electrode spaced from each other at a predetermined interval;

said holding means including a cooling means for cooling said substrate.

17. An apparatus as defined in claim 14 or 15, further comprising a surrounding means for surrounding at least said first electrode, said second electrode and an arc discharge region in which said arc discharge is generated between said first electrode and said second electrode.

18. A method for patterning a nano-tube, comprising the steps of:

arranging a first electrode and a second electrode in a manner to be opposite to each other in an air atmosphere, said second electrode being made of a material mainly consisting of a carbon material;

applying a voltage between said first electrode and said second electrode to generate arc discharge therebetween; and

forming a carbon material on a predetermined region of said second electrode into a nano-tube due to said arc discharge while moving said first electrode and second electrode relatively to each other.

19. A method for patterning a nano-tube, comprising the steps of:

arranging a first electrode and a second electrode in a manner to be opposite to each other in an air atmosphere, said second electrode being made of a material mainly consisting of a carbon material selected from the group consisting of a carbon material formed into any pattern-like shape, that containing a metal catalyst formed into any pattern-like shape and that having a metal catalyst formed into any pattern-like shape on a surface thereof;

applying a voltage between said first electrode and said second electrode to generate arc discharge therebetween; and

forming a carbon material on a predetermined region of said second electrode into a nano-tube due to said arc discharge.

20. A method for patterning a nano-tube, comprising the steps of:

arranging a first electrode and a second electrode in a manner to be opposite to each other in an air atmosphere;

arranging a mask of any opening pattern on a surface of said second electrode;

applying a voltage between said first electrode and said second electrode to generate arc discharge therebetween; and

forming a carbon material on a predetermined region of said second electrode corresponding to openings of said mask into a nano-tube.

21. A method as defined in any one of claims 18 to 20, wherein said first electrode is constituted by a torch electrode provided at an arc torch.

22. A nano-tube material patterned according to the method defined in any one of claims 18 to 21.

23. An electron emission source having the patterned nano-tube material defined in claim 22 incorporated therein.